WESTON
MODEL 310
SINGLEPHASE
WATTMETERS

INSTRUCTION BOOK

WESTON ELECTRICAL INSTRUMENT CORP.
NEWARK, N. J.

5-3950
MPL

Instructions

for the use of

Model 310 Singlephase Wattmeters

Including Connection Diagrams

Weston Electrical Instrument Corp.
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Instructions for Using Weston A. C. and D. C. Wattmeter, Model 310

THE Weston Model 310 Wattmeter is an electrodynamometer wattmeter; its indications are based on the Absolute Volt and Ampere, and are equally accurate for direct current and alternating current measurements, within the limits stated on the certificate accompanying the instrument.

SHIELDING The instrument is shielded from the effect of external magnetic fields by means of a double iron shield.

When using the instrument on direct current, if it is desired to obtain the greatest accuracy, the mean of reversed readings should be taken, to eliminate the effect of any slight residual magnetism in the shield which may have been produced by exposure to strong magnetic fields.

To obtain reversed readings the connections to the current circuit must be reversed and the reversing switch set to "Reverse."

ZERO ADJUSTER A zero adjuster is provided to set the pointer on zero when no connection is made to the instrument. If the pointer is off zero it should not be reset until the scale glass has been discharged of all static by breathing upon it. If a zero correction of more than 5%, in terms of full scale, is necessary set the pointer to zero but check the balance as well. An abnormal zero shift may be due to a bent pointer.

RANGES In general the instrument has two current and three potential ranges which are self-contained. The current ranges are changed by means of links which connect the two sections of the field coils in series or in multiple. (See certificate.) The potential ranges are changed by making the connections to individual binding posts.

EXTENSION OF RANGES If the instrument has a current range of 5 amperes, it can be used with current transformers to extend the range.

If the instrument has a 100 to 150-volt range the potential range can be extended by using potential transformers. For voltages less than 750 volts a multiplier may be used; for voltages above 750 volts both current and potential transformers should be used.

THE SCALE The scale is drawn and figured so as to permit readings being taken with the greatest facility and accuracy. To accomplish this each scale division represents units of 1, 2 and 5 or decimal multiples of them.

In every case the factor by which the scale reading must be multiplied in order to ascertain the watts indicated is given on the certificate. Each range of the instrument is provided for in this manner.

Model 310 Wattmeter, Form 1

GENERAL ARRANGEMENT Figure 1 shows the general arrangement of the binding posts, reversing switch, contact key, etc., and in Figure 2 the relation of the internal connections to the binding posts, etc., is shown.

POLARITY The sign ± used in reference to the binding posts of the current and potential circuits signifies that the instantaneous currents entering into or passing out from these binding posts, have the same direction, for a positive indication.

CONTACT KEY The potential circuit is provided with a contact key which in its normal position opens the circuit. Readings are taken by depressing the key. If desired, the key may be locked by giving it a slight turn when depressed.

REVERSING SWITCH The reversing switch is in the potential circuit, and is used for changing the polarity of this circuit. Whenever the pointer of the instrument deflects below zero, it can be made to deflect up the scale without changing the connections to the instrument by turning the reversing switch. This will be found particularly advantageous when using the instrument to measure the power in polyphase circuits. (See Figures 14 and 15 and note under Figures 14 and 15, pages 26 and 27.)

When the reversing switch is at the position marked "Direct" the polarity of the potential circuit is as marked on the instrument.

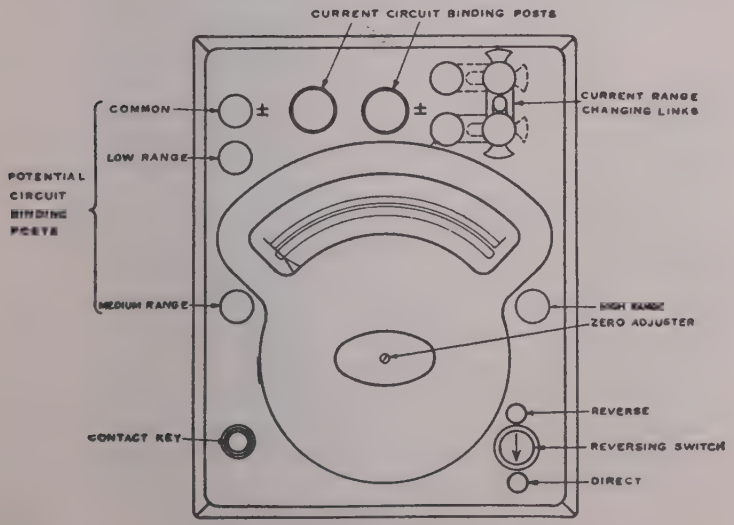

Figure 1

Arrangement of Binding Posts, Range Changing Links, Etc., on the Model 310 Wattmeter, Forms 1 and 3.

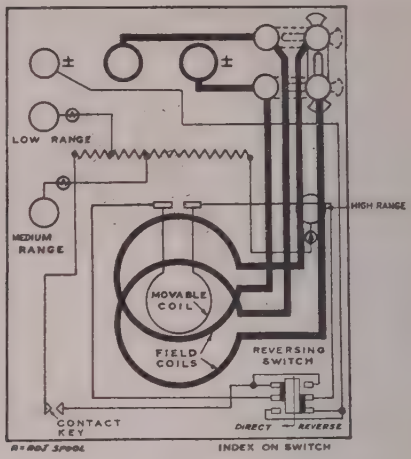

Figure 2

Internal Connections of Model 310 Wattmeter, Forms 1 and 3.

NOTE: Figures 1 and 2. When the links are in the position indicated by full lines the sections of the field are connected in series and the instrument is ready for use on the low current range. When the links are in the position indicated by dotted lines the sections of the field are connected in multiple and the instrument is ready for use on the high current range.

The links should be tightly screwed in position, otherwise one section of the current circuit may carry more current than the other section and become heated when using the instrument at its full rated current capacity.

OVERLOAD CAPACITY The field coils have an overload capacity of 100 per cent; that is, they are capable of continuously carrying twice the normal

rated current. This is of great advantage when making measurements on circuits of low power factor.

In various ranges of the instrument the potential circuits have an average overload capacity of 50 per cent. The actual overload capacity is stated on the certificate which accompanies the instrument. This overload capacity is convenient when it is desired to get an increased deflection (within the overload limits) and the current circuit can not be arranged to accomplish this.

TEMPERATURE CORRECTIONS The instrument is in general compensated for temperature errors. If in a special instance this is not so, the factor by which the indicated watts must be multiplied to get the actual watts, is given on the certificate.

PHASE ANGLE The phase displacement or shift which is usually known as the phase angle of the wattmeter is the difference between the true phase angle in the circuit under test and the apparent phase angle which enters into the wattmeter measurement. This phase shift or angle is produced in general in two ways: (1) The potential circuit has a small inductance which causes the current through it to lag behind the impressed voltage by a small angle. (2) Foucault or eddy currents are generated in the metal of the field coils and in the surrounding metal parts resulting in the magnetic field not being exactly in phase with the field coil current producing it, but lagging behind the field coil current by a small angle.

In the Model 310 Wattmeter, Form 1, the phase angle has been reduced to a small value for frequencies as high as 125 cycles per second. This has been accomplished by making the inductance of the potential circuit small and reducing the

effect of Foucault currents by making the metal parts surrounding the coils of a special high resistance alloy and by a proper design as to the form and location of these parts.

The importance of having the wattmeter phase angle small can be appreciated by reference to the following illustration. Suppose we have a wattmeter the phase angle of which is 10 minutes. At 95 per cent power factor the error will be less than 0.1 of 1 per cent, but at 20 per cent power factor the error will be approximately 1.4 per cent.

FREQUENCY ERRORS Near unity power factor, the errors due to phase angle (see page 9) are negligible for frequencies up to 125 cycles per second on the Form 1 instrument. As the power factor approaches 50%, the error increases but is less than 0.30% on ranges below 100 volts and less than 0.15% for ranges of 100 volts and higher. These values apply at 125 c.ps. At 60 cps, the errors are less than one-half of these values

At the higher frequency, the errors remain small near unity power factor but become large as the power factor of the load decreases. For example, at 400 cps and 50% power factor, the error is approximately 0.75% on the 100-volt range. This error decreases slightly on higher ranges but may be much larger on lower ranges.

CONSTANTS OF THE INSTRUMENT The resistance and inductance of the current and potential circuits for the various ranges are given on the certificate. These values will be found of use when allowing for instrument losses as hereinafter described, and for correcting for transformer errors when the instruments are used in conjunction with transformers.

For methods of corrections and uses of the instruments, see pages 15 to 21.

Low Power Factor Model 310 Wattmeter, Form 2

GENERAL ARRANGEMENT Figure 3 shows the general arrangement of the binding posts, compensating switch, reversing switch, etc. Figure 4 shows the relation between the internal connections and binding posts, etc. (Note: The compensation feature is omitted on instruments with current ranges below one ampere and instruments made for frequencies above 125 cycles. See Form 1 for arrangement and internal connections.)

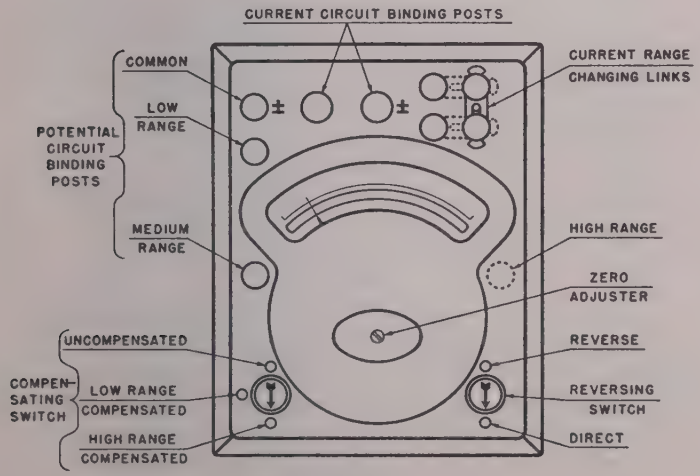

Figure 3

Arrangement of Binding Posts, Range Changing Links, Etc., on the "Low Power Factor" Model 310 Wattmeter, Form 2.

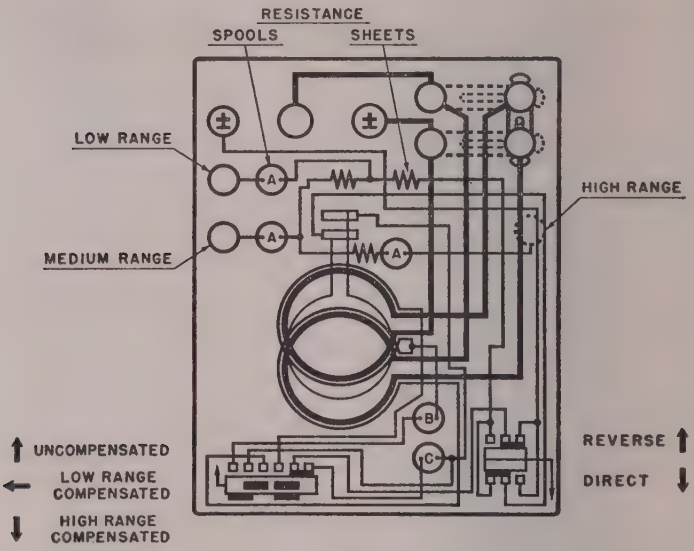

Figure 4

Internal Connections of the "Low Power Factor" Model 310 Wattmeter, Form 2.

NOTE: Figures 3 and 4. When the links are in the position indicated by full lines the sections of the field are connected in series and the instrument is ready for use on the low range. When the links are in the position indicated by dotted lines the sections of the field are connected in multiple and the instrument is ready for use on the high current range.

The links should be tightly screwed in position, otherwise one section of the current circuit may carry more current than the other section and become heated when using the instrument at its full rated current capacity.

COMPENSATION When a wattmeter is connected to a circuit with its potential element connected across the load, the current through the field coils (current element) is the sum of the load current and the current required by the potential circuit of the instrument. This introduces an error in the indication of the instrument.

In order to eliminate this error in the "Low Power Factor" Model 310 Wattmeter, Form 2, most of the instruments are compensated for the power taken by the potential circuit. The compensation is effected by means of a winding connected in the potential circuit having the same effective number of turns as the field winding, and wound in such a direction that the current in it is opposite to that in the field winding. The current in this winding then exactly neutralizes that part of the current in the field winding which supplied the potential circuit.

COMPENSATING SWITCH The compensating switch (Figure 3, page 11) is capable of being set at three different positions. (1) The position for using the instrument uncompensated, in which condition its connections are the same as for the Model 310 Wattmeter, Form 1; (2) the position for using the instrument compensated for the high current range, and (3) the position for using the instrument compensated for the low current range.

CURRENT AND VOLTAGE CAPACITY The maximum capacity of the various current and potential ranges is given on the certificate. These values should not be exceeded.

The maximum capacity in volt-amperes is five times the maximum scale reading in watts.

TEMPERATURE CORRECTIONS For ordinary measurements it is not necessary to correct for changes in temperature. When very precise measurements

are desired the reading should be corrected by applying the proper correction, which is given on the certificate.

PHASE ANGLE The phase angle is the same as that described for the Form 1 instrument on page 9 except that the potential circuit power compensating windings add additional inductance to the potential circuit. This additional inductance is negligible on the high current ranges such as 10/5 amperes but can cause a large phase angle on the low current range such as 2/1 amperes. This is characteristic of the 75-volt range. On the 150-volt range, the additional series resistance is enough to reduce the phase angle to a negligible value at 60 cps.

It is very important that the phase angle of the Form 2 wattmeter be kept at a very small value since it is used on low power factors. A phase angle of 2 minutes will cause a 0.3% error at 20% power factor and, except for the low current ranges as explained above, the phase angle of the Form 2 instrument is below 2 minutes at 60 cps.

FREQUENCY ERRORS The frequency error is caused by the phase angle of the wattmeter as described above. At 60 cps and at 20% power factor, the frequency error is negligible on the 150-volt range. On the 75-volt range it is less than 0.25% on all ranges except the 2/1 ampere current range when used in the compensated position. At 125 cps and 20% power factor, the frequency error is less than 0.25% on the 150-volt range and less than 0.5% on all ranges except the 2/1 ampere current range when used in the compensated position.

Instruments have a frequency range of d-c and 25-125 cycles will have large errors at higher frequencies due to the capacity between the field coil and compensating windings. For higher frequencies, a special frequency compensated meter must be used having the compensating windings omitted.

CONSTANTS OF THE INSTRUMENT The resistance and inductance of the current and potential circuits for the various ranges are given on the certificate.

These values will be found of use in making corrections for the instrument losses when using the uncompensated instrument or the "Uncompensated" position and as a means for determining the load on transformers when used in conjunction with the wattmeter, in order to allow for the transformer errors.

For methods of correction and uses of the instrument see pages 19 to 21.

Model 310 Wattmeter, Form 3

Form 3 Wattmeter is designed for use on circuits having frequencies greater than 125 cycles per second, such as are found in generators with a frequency of 400 or 800 cycles per second.

It is the same as Form 1 Wattmeter except that the temperature compensating feature is omitted. The error due to change in temperature, however, may be neglected for ordinary measurements. When precise measurements are desired, multiply the wattmeter indications by the correction factor which is stated on the certificate accompanying the instrument.

FREQUENCY ERRORS The instrument is within the accuracy stated on the certificate at unity power factor and over the frequency span given. As the power factor decreases, the frequency error increases and at 50% power factor is less than 0.25% at 400 cps and 0.5% at 800 cps.

Use of the Model 310 Wattmeter, Form 1

The instrument should be connected to the circuit as shown in the diagrams beginning with page 22, which cover all of the circuit conditions usually met with in practice.

In general, connect the field or current coil in series with the load and the potential circuit across or in parallel with the load as shown in Figure 6, page 22. Always connect the ± binding post of the potential circuit to the same side of the circuit under test in which the current coil of the wattmeter is connected. This should be done so as to have the current and potential coils at the same potential to eliminate the electrostatic attraction between them, which would otherwise introduce an error in the indications.

REVERSING SWITCH If the ± potential connection is properly made to the same side of the line in which the current coil is connected as shown in Figure 6, and if a negative deflection results when the reversing switch stands at "Direct," then this shows that the current circuit connections were incorrectly made and should be either interchanged or the reversing switch changed to "Reverse."

Figure 6, page 22, shows the simplest case of connections where the wattmeter is connected directly to the load. It will be noted that the field coils carry both the load current and the current required by the potential circuit, so that the indication of the wattmeter includes the power lost in its own potential circuit. The instrument is not compensated for this loss, but as the average value for the regular wattmeter is only about 2 watts at a potential of 110 volts, a correction need not be made for it when a loss of 2 watts is negligible in comparison to the watts of the load under test. In testing other wattmeters, if the diagrams are followed, the wattmeter loss does not enter in and of course does not need to be considered.

When current and potential transformers are used, the correction for the wattmeter loss usually becomes so small as to be negligible.

In making measurements where the wattmeter loss cannot be neglected, the indications can be corrected as shown on page 21.

UTILIZATION OF OVERLOAD CAPACITY The advantage of an instrument with an overload capacity is best demonstrated by means of an example. Suppose we have a wattmeter, rated current capacities of 5 and 10 amperes, rated potential capacities of 50, 100 and 200 volts. The maximum capacities of this instrument are 10 and 20 amperes, 75, 150 and 300 volts respectively.

We wish to use the instrument to ascertain the power in a circuit, the current being 6 amperes, voltage 110 volts and power factor 75 per cent. The watts indicated on the instrument will be $6 \times 110 \times 0.75 = 495$ watts. Ordinarily the 10-ampere and 100-volt ranges would be used, the watt range being 1000 watts for full scale deflection.

The indication produced by 495 watts would be a little less than half scale. Since the 5-ampere range can carry 10 amperes, this range can be used with the 6-ampere current, thus getting a pointer deflection twice that obtained before, the full scale value now being 500 watts. In this way it is possible to obtain more accurate readings than at a lower portion of the scale.

Numerous instances will occur in practice where the overload feature will be found of great value.

USE OF MULTIPLIER When a multiplier is used, it must be connected to the range of the instrument to which it is adjusted. For example, suppose we have an instrument with potential ranges of 50, 100 and 200 volts, and a multiplier for 500 volts.

The post marked $\frac{1}{100}$ V is to be connected to the 100-volt post of the wattmeter. The post marked $\frac{5}{500}$ V may be con-

nected to the circuit having potentials up to 500 volts and also indicates that the readings of the wattmeter scale are to be multiplied by 5.

Care must be taken never to connect the multiplier to the ± binding post of the instrument, as such a connection will put the full line voltage between the current and potential coils, which may cause electrostatic attraction between them introducing errors and placing an unnecessary stress upon the insulation. (See Figure 7, page 22.)

ALTERNATIVE METHOD OF CONNECTIONS The wattmeter may be connected to the circuit as shown in Figure 5, below. In this

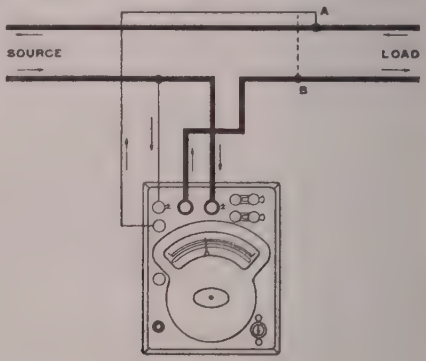

Figure 5

Connections for Measuring D. C. and Single Phase A. C. Power; Instrument Connected to Include in the Indication Its Current Circuit Losses.

method the potential circuit of the wattmeter is connected on the source side of the current coil and the instrument includes in its indication the power lost in the circuit between the potential circuit connection and the load; that is, the loss

in switches, fuses, or other auxiliary apparatus, as well as in the current or field coils of the instrument.

This method of connection possesses several disadvantages; when current transformers are used it is difficult and often impracticable to allow for the losses, and in all cases the losses vary with the current and with changes in temperature, so that the correction to be applied very often cannot be accurately determined.

In cases where the only loss between the wattmeter connection and the load is that of the wattmeter current circuit, the loss is usually so small that it can be neglected.

Should any circumstances arise necessitating the use of this method of connection, the wattmeter indication may be corrected as shown on page 21, or the loss may be experimentally determined by changing the potential connection from A to B in Figure 5, page 18.

Use of the "Low Power Factor" Model 310 Wattmeter, Form 2

The general directions given under "Use of the Model 310 Wattmeter, Form 1," page 15, and diagrams of connection, pages 22 to 37, apply to this instrument.

Turn the reversing switch to the position marked "Direct." If the indication of the instrument is reversed when connections have been made according to instructions, change the reversing switch to the position marked "Reverse."

When the instrument is connected directly to the load it may be used either compensated or uncompensated. When current or potential transformers are used the instrument **must be used uncompensated.**

When using the instrument compensated the compensating switch is set to that position corresponding to the current range being used.

When using the instrument uncompensated the compen-

sating switch is set to the uncompensated position. The instrument is then similar to the Model 310 Wattmeter, Form 1. If it is necessary to apply corrections for the instrument losses the same methods are employed as for the Model 310 Wattmeter, Form 1. (See page 21.)

When using the instrument for measurement of three phase power by means of the two wattmeter method the compensating switch should be set to "Uncompensated." If necessary the readings should be corrected for the power taken by the instrument.

The "Alternative Method of Connections" should only be used with the instrument uncompensated.

Particular Applications of the Instrument

Because of the high volt-ampere capacity of the instrument it is particularly well adapted for making measurements on circuits in which the current and voltage are high and the power factor low, such as in the case when making core loss measurements on transformers. As an illustration suppose the wattmeter has a maximum current capacity of 5 amperes and maximum voltage capacity of 150 volts. The maximum volt-ampere capacity will be 750 volt-amperes. A full scale deflection, however, will be obtained with 150 watts.

The instrument can also be used in measuring the watt losses in parts of an ordinary circuit wherein the current is comparatively high and the voltage across the part to be tested comparatively low.

It can also be used in making power measurements on circuits of comparatively high current but of low voltage source.

Use of the Model 310 Wattmeter, Form 3

The Form 3 Wattmeter is used in the same manner as the Form 1 Wattmeter and the instructions on pages 15 to 19 should be referred to.

Method of Correcting for Wattmeter and Transformer Losses

The loss in the Form 1 or Form 3 wattmeter potential circuit at 115 volts is only about 2.1 watts and in the current circuit at normal current capacity is only about 0.7 watt.

The loss in the Form 2 wattmeter potential circuit at 115 volts is from 3 to 5 watts and in the current circuit at maximum current capacity is approximately 3 watts.

In the measurement of small loads using connections shown in Figures 6 to 11 inclusive, where the wattmeter or transformer losses form a considerable part of the indicated load, the indications may be corrected for both wattmeter and transformer loss by opening the load circuit on the load side of the wattmeter or transformer connection. The resulting indication represents the sum of all losses. This should be subtracted from the total load indication and the remainder multiplied by the proper transformer and wattmeter ratios to obtain the true load.

CAUTION Always connect the ± binding post of the potential circuit to the same side of the circuit under test which contains the current coil of the wattmeter. This should be done so as to have the current and potential coils at the same potential to eliminate the electrostatic attraction between them, which would otherwise introduce an error in the indication.

When current or potential transformers are used it is necessary to connect the ± binding post of the potential circuit to the ± binding post of the current circuit. When both potential and current transformers are used the connection between the ± binding posts should be grounded.

Connection Diagrams

Connections for Measuring D. C. and Single Phase A. C. Power

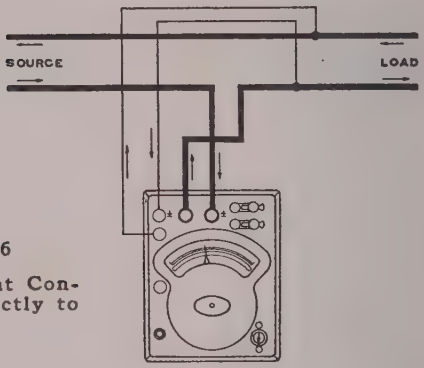

Figure 6

Instrument Connected Directly to Load.

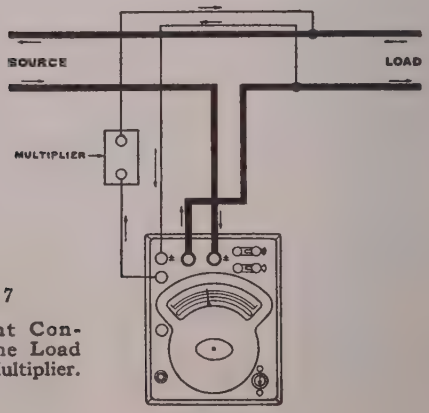

Figure 7

Instrument Connected to the Load Through a Multiplier.

Connections for Measuring Single Phase A. C. Power

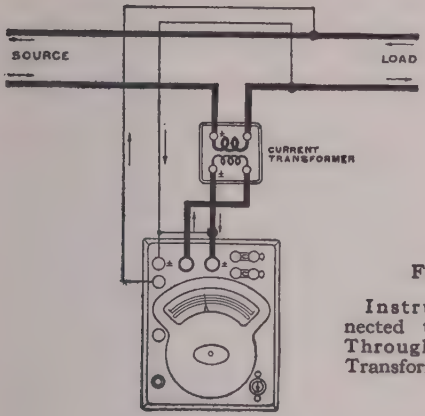

Figure 8

Instrument Connected to the Load Through a Current Transformer.

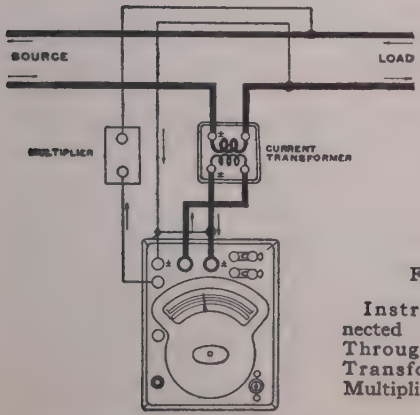

Figure 9

Instrument Connected to the Load Through a Current Transformer and a Multiplier.

See Caution Note on page 21.

Connections for Measuring Single Phase A. C. Power—Continued

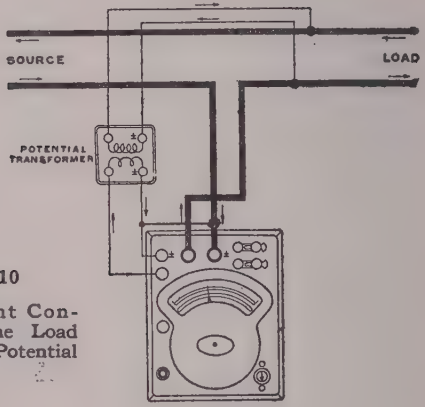

Figure 10

Instrument Connected to the Load Through a Potential Transformer.

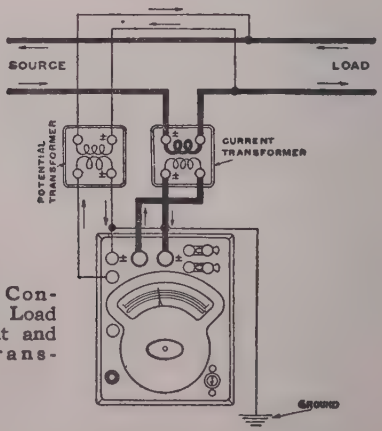

Figure 11

Instrument Connected to the Load Through Current and Potential Transformers.

See Caution Note on page 21.

Connections for Checking Model 310 Wattmeters

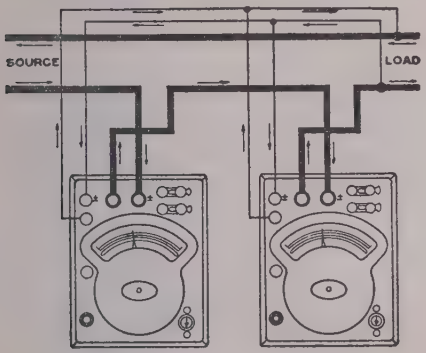

Figure 12

Connections for Comparing Two Wattmeters, Using D. C. or A. C. Source; Instruments Connected Directly to the Load.

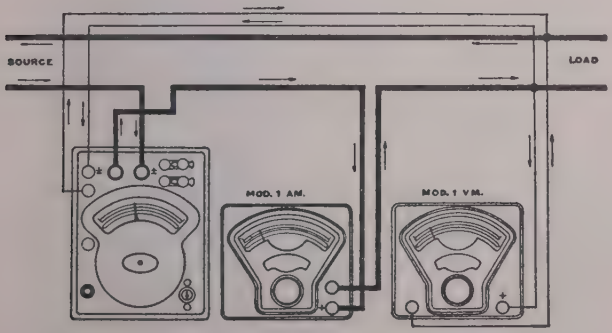

Figure 13

Connections for Checking a Wattmeter with Ammeter and Voltmeter Using a D. C. Source.

Connections for Measuring Power in D. C. Single, Two and Three Phase A. C. Three-Wire Circuits

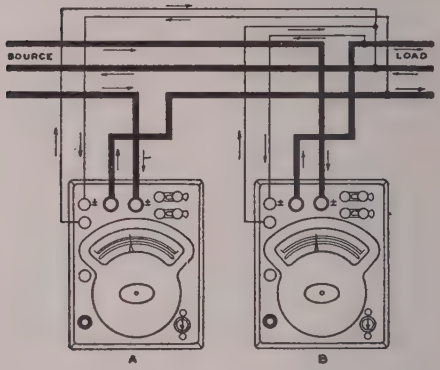

Figure 14

Instruments Connected Directly to the Load.

Note: For Three Phase Circuits, if both instruments deflect toward the top of the scale, when connected as shown, the true power is the sum of their indications. If one instrument deflects negatively, which will be the case when the power factor is below 50%, change the Reversing Switch and subtract the indication from that of the other instrument to obtain the true power. If only one Wattmeter is available connect it successively as A and B in cut and proceed as directed above. Arrows indicate directions of current for Two and Three Phase Circuits but not for D. C. or Single Phase Circuits.

Connections for Measuring Power in Single, Two and Three Phase, Three-Wire A. C. Circuits

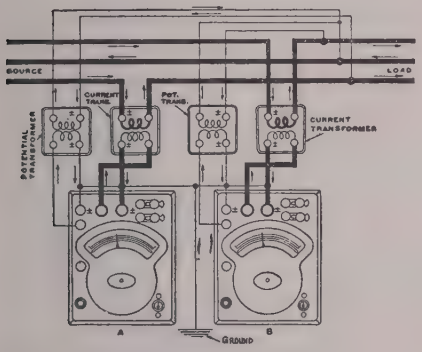

Figure 15

Instruments Connected to the Load Through Current and Potential Transformers.

Note: For Three Phase Circuits, if both instruments deflect toward the top of the scale, when connected as shown, the true power is the sum of their indications. If one instrument deflects negatively, which will be the case when the power factor is below 50%, change the Reversing Switch and subtract the indication from that of the other instrument to obtain the true power. If only one Wattmeter is available connect it successively as A and B in cut and proceed as directed above. Arrows indicate directions of current for Two and Three Phase Circuits but not for Single Phase Circuits.

See Caution Note on page 21.

Connections for Checking Watthour Meters by Means of Model 310 Wattmeter

Two-Wire Watthour Meter with Only One Side of the Circuit Passing Through the Watthour Meter

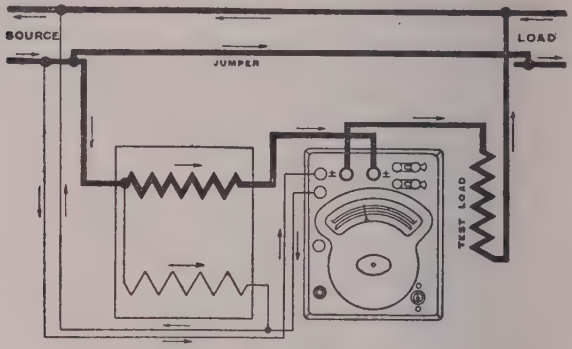

Figure 16

Connections for Testing a Watthour Meter by Means of a Weston Model 310 Wattmeter and Test Load.

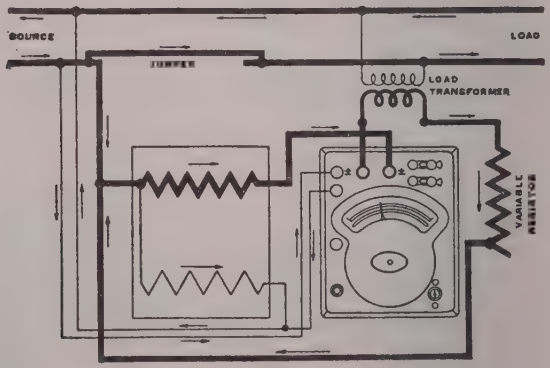

Figure 17

Connections for Testing a Watthour Meter by Means of a Weston Model 310 Wattmeter and a Load Transformer.

Connections for Checking Watthour Meters by Means of Model 310 Wattmeter

Two-Wire Watthour Meter with Both Sides of the Circuit Passing Through the Watthour Meter

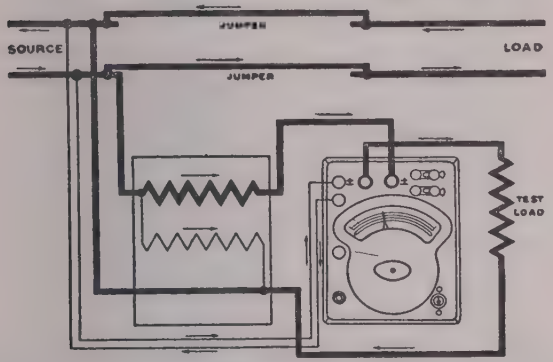

Figure 18

Connections for Testing a Watthour Meter by Means of a Weston Model 310 Wattmeter and Test Load.

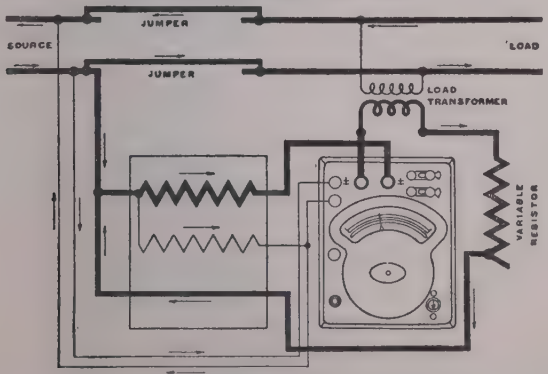

Figure 19

Connections for Testing a Watthour Meter by Means of a Weston Model 310 Wattmeter and a Step-Down Load Transformer.

Connections for Checking Three-Wire Watthour Meters by Means of Model 310 Wattmeter

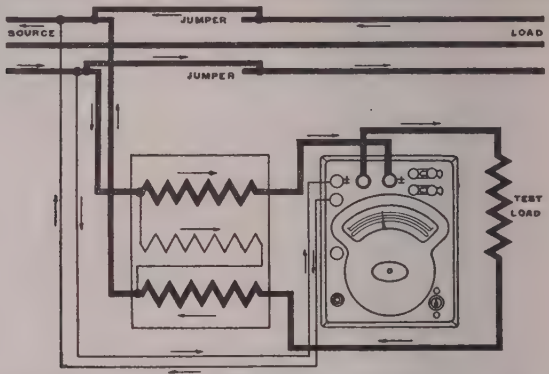

Figure 20

Connections for Testing a Watthour Meter by Means of a Weston Model 310 Wattmeter and Test Load.
(Potential circuit connected to outer wires.)

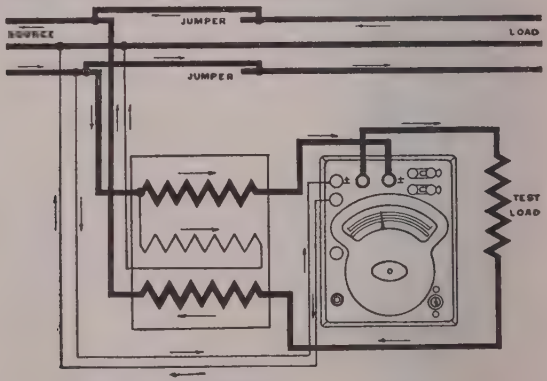

Figure 21

Connections for Testing a Watthour Meter by Means of a Weston Model 310 Wattmeter and Test Load.
(Potential circuit between neutral and one outer wire. Test constant of the watthour meter is halved.)

Connections for Checking Polyphase Watthour Meters by Means of Model 310 Wattmeter

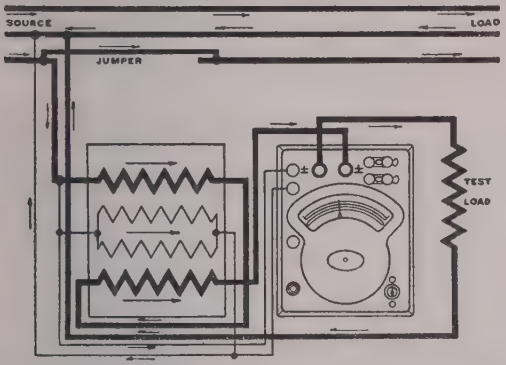

Figure 22

Connections for Testing a Polyphase Watthour Meter as a Single Phase Instrument by Means of a Weston Model 310 Wattmeter and Test Load. (Watthour meter current coils in series and potential circuits in parallel.)

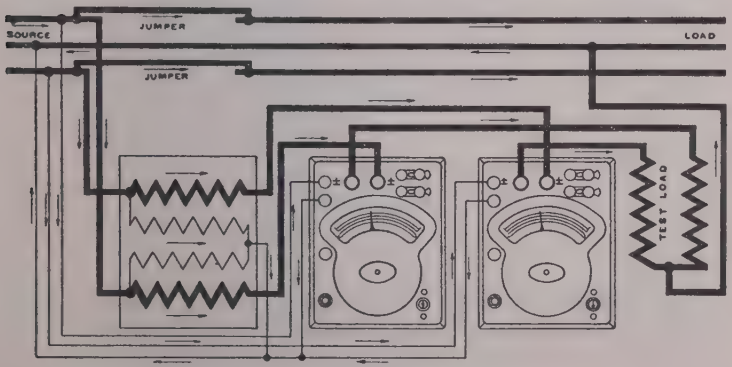

Figure 23

Connections for Testing a Polyphase Watthour Meter by Means of Two Weston Model 310 Wattmeters and an "Open Delta" Connected Test Load Using a Three Phase or a Two Phase Three Wire Source.

Connections for Checking Watthour Meter with Current Transformer by Means of Model 310 Wattmeter

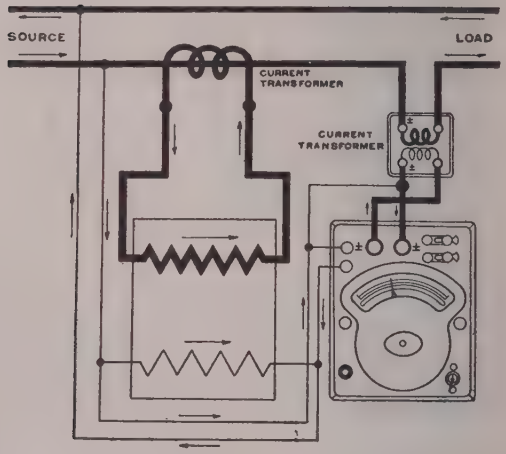

Figure 24

Connections for Testing a Watthour Meter Used with a Current Transformer, by Means of a Weston Model 310 Wattmeter with Current Transformer, Using Consumer's Load.

See Caution Note on page 21.

Connections for Checking Watthour Meter with Current Transformer by Means of Model 310 Wattmeter

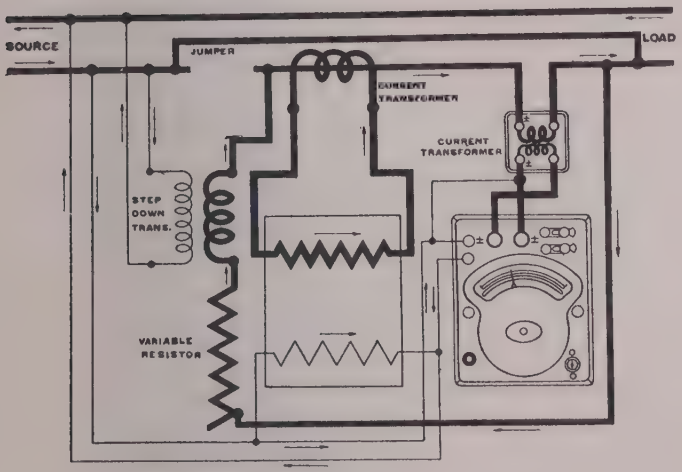

Figure 25

Connections for Testing a Watthour Meter by Means of a Weston Model 310 Wattmeter and Current Transformer and a Step-Down Transformer Connected to the Service Lines.

See Caution Note on page 21.

Connections for Checking Watthour Meter with Current Transformer by Means of Model 310 Wattmeter

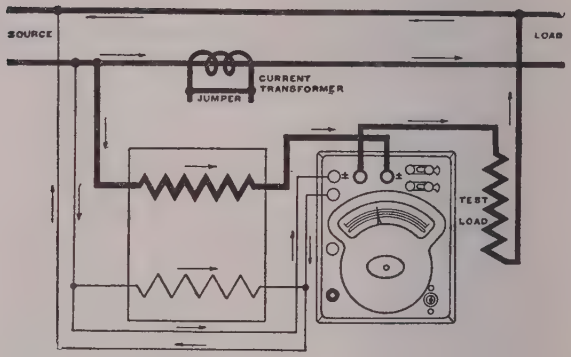

Figure 26

Connections for Making Secondary Test on a Watthour Meter by Means of a Weston Model 310 Wattmeter and Test Load.

Note: The Jumper must be put in place before opening the Watthour Meter Current Circuit.

Connections for Checking Watthour Meter with Current and Potential Transformers by Means of Model 310 Wattmeter

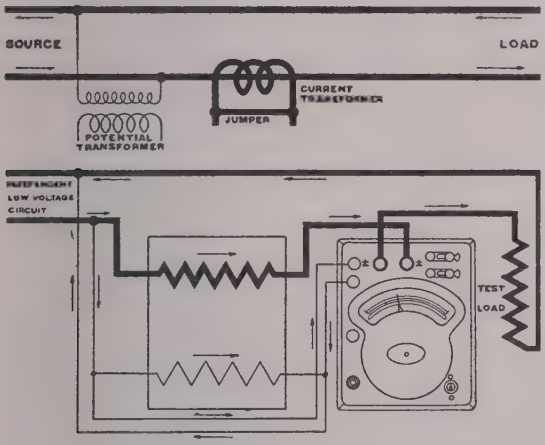

Figure 27

Connections for Testing a Watthour Meter from an Independent Low Voltage Source by Means of a Weston Model 310 Wattmeter and Test Load.

Note: The Jumper must be put in place before opening the Watthour Meter Current Circuit.

Connections for Checking Watthour Meter with Current and Potential Transformers by Means of Model 310 Wattmeter

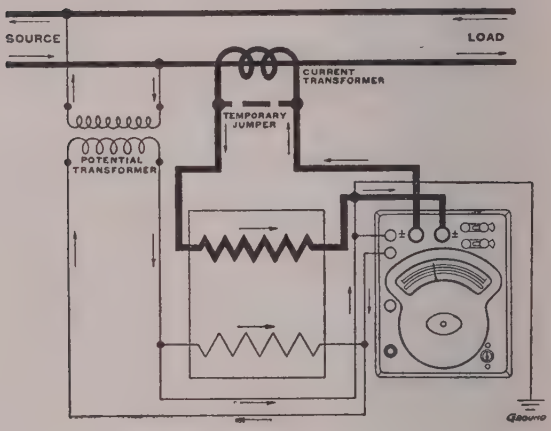

Figure 28

Connections for Testing a Watthour Meter When Equipped with Current and Potential Transformers by Means of a Weston Model 310 Wattmeter.

Note: The Temporary Jumper must be put in place before opening the Watthour Meter Circuit to insert the Wattmeter, and may only be removed after the circuit is again completed.

See Caution Note on page 21.

Connections for Checking Watthour Meter with Current and Potential Transformers by Means of Model 310 Wattmeter

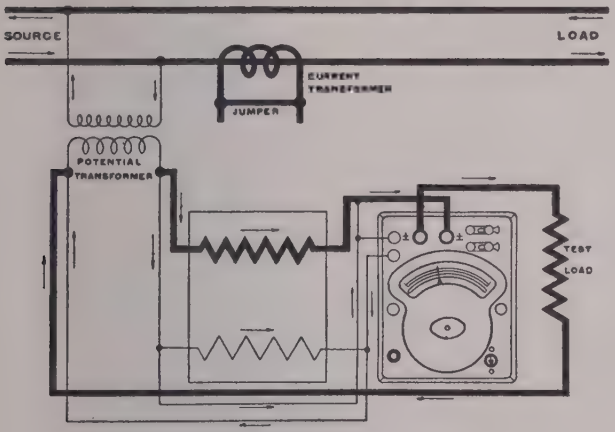

Figure 29

Connections for Testing a Watthour Meter on a Low Load from the Secondary of the Potential Transformer by Means of a Weston Model 310 Wattmeter and Test Load.

Note: The Jumper must be put in place before opening the Watthour Meter Current Circuit.

See Caution Note on page 21.

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